FOSS

Balance and Motion

Concept and Lesson Map

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FOSS Concept and Lesson Map: Balance and Motion

The Big Picture

The “Big Idea” for force and motion in the 2-3 grade band is “Forces on objects make them move. Changes in forces will cause changes in motion... Emphasis should be on comparisons of forces and motions.” - Washington State Science Standards 2010 2-3 Physical Science. Investigations 1-3 are great for EALR 2: Inquiry. Investigation 4 targets forces and motion.

Investigation 1: Balance

Goal: Objects can be balanced in many ways.

Part 1:
Trick Crayfish
Students balance a tagboard cutout of a crayfish on fingertips. After finding the balance point, students try to balance the crayfish on its edge, tail, and “nose”.

IQ: How many ways can a shape be balanced?

Part 2:
Triangle and Arch
Students balance tagboard geometric shapes in a variety of ways on the end of a craft stick, using clothespins as counterweights.

IQ: How can counterweights help us balance other shapes?

Part 3:
Twirlers
Students use a piece of soft wire and clothespins to balance a pencil on its point in a stable position.

IQ: How can a pencil be balanced on its point?

Part 4:
Mobiles
Students make mobiles to confirm developing concepts of balance, counterbalance, and stability.

IQ: How do the parts of a mobile stay in stable positions?

Supplemental Investigation 1b: Forces and Motion

Goal: These investigations directly address the state standards. They focus students on how forces of particular strengths and in particular directions affect the motion of objects.

Part 1: Make that Car Move!

Investigating question: What different ways can you find to make a car move on the track?

Create a “track” by laying out two meter sticks on a long, flat table. Line up the measurement numbers and place the toy car between the meter sticks.

Students try to come up with all the possible ways to get the car to move along the track (pushing it or pulling it in different ways).

Focus the exploration with questions that lead students to see examples of “force” being a “push” or a “pull” and then comparing “soft” and “hard” forces.

Conclude by organizing, with students, all their observations into similar groups. The two groups they are likely to end up with are pushes and pulls.

Part 2: Make that Marble Move!

Investigating question: How can a stationary ball be affected by a ball launched at it in different ways?

Create a track: line up the numbers on two meter sticks then tape together. Fold to form a “v” and place a ball of clay under each end to hold it in place.

Students place a marble at the 50-cm point. From the “zero” end of the track, students launch a second marble at the stationary one in various ways (hard, soft, different heights through a toilet paper roll, etc). Students observe and record how these launches change the 50-cm ball’s motion.

Focus the exploration with questions that lead students to see examples of changes in force causing changes in motion.

Part 3: Make that Marble REALLY Move!

Investigating question: How can a stationary ball be affected by a balls of different mass launched at it?

Using the same marble track from supplemental lesson #2, use marbles of various weights (and/or sizes) to conduct the same investigations.

Focus the exploration with questions that lead students to see that the mass of the object affects how the objects move.

Investigation 2: Spinners

Goal: Discover different ways to produce rotational motion. Explore variables that influence the spinning of tops, zoomers, and twirlers.

Part 1:
Tops
Students observe the arrangements of parts of a top system to find out which arrangement makes the best top.

IQ: How can spinning tops be changed?

Part 2:
Zoomers
Students construct “zoomers” from paper discs and strings.

IQ: How can a spinning object be kept in motion?

Part 3:
Twirlers
Students observe and refine flying spinner designs.

IQ: How can air start an object spinning?

Investigation 3: Rollers

Goal: Wheels and spheres roll down a slope. Wheel-and-axle systems can be changed by changing the location and amount of weight.

Part 1:
Rolling Wheels
Students experiment with wheel-and-axle systems on ramps to see which configurations can perform a variety of tricks.

IQ: How can a wheel-and-axle system be changed?

Part 2:
Rolling Cups
Students observe paper cups rolling down ramps and use the predictable curved rolling path to meet challenges.

IQ: Can we predict the behavior of a rolling-cup?

Part 3:
Rolling Spheres
Students roll marbles in cups and down runways to observe spheres as rollers. They work with the flexible runways to make the rolling marbles do tricks.

IQ: How can we make a runway system that will keep a marble rolling?

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